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WHAT DRIVES MOBILE IN-APP PURCHASES?

An Extended Framework of In-App Purchase and Monetary Effort

Vicente Xavier Cavaleiro Costa

Dissertation presented as partial requirement for obtaining the Master's degree in Information Management

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by

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Dissertation presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Marketing Intelligence

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ABSTRACT

Past research has focused on mobile app use intention and acceptance but did not provide insights on the factors influencing in-app purchase and monetary effort. This study contributes to filling this gap by analyzing how relevant personality-based variables such as stickiness and innovativeness influence in-app purchase and monetary effort. We extend the affect–behavior–cognition (ABC) model of attitudes by developing a framework that evaluates the relevance of not only attitude but also stickiness, satisfaction, social identification, and innovativeness on mobile in-app purchase intention and monetary effort. We develop a study with 303 European consumers about mobile apps, using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that attitude, satisfaction, innovativeness, and stickiness help to explain purchase intention and monetary effort of mobile in-app purchases. In addition, the findings suggest that attitude and satisfaction are, respectively, important moderators of stickiness and in-app purchase intention on in-app monetary effort. The findings have implications for companies on what factors to consider when developing a mobile app for monetization purposes.

KEYWORDS

Mobile Apps; Monetary Effort; In-App Purchase; Innovativeness; Stickiness.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABC	Affect–Behavior–Cognition
PLS	Partial Least Squares
SEM	Structural Equation Modeling
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behavior
TAM	Technology Acceptance Model
IN	Innovativeness
SI	Social Identification
SF	Satisfaction
ATT	Attitude
STK	Stickiness
IAP	In-App Purchase Intention
IME	In-App Monetary Effort
CA	Cronbach's Alpha
CR	Composite Reliability
AVE	Average Variance Extracted
HTMT	Heterotrait-Monotrait Ratio
VIF	Variance Inflation Factor

1. INTRODUCTION

Mobile applications (apps) are a worldwide phenomenon that is continuously growing in terms of usage in the last couple of years (Dash, 2017). Mobile apps have gained a steady and preponderant role in our lives, because of the increased use of smartphones and communication technologies (Lella, 2017). In 2017, approximately 178.1 billion of apps were downloaded, a number expected to increase to 205.4 billion in 2018 and 258.2 billion by 2021 (Statista, 2018a). Mobile app revenues reached 61.9 billion dollars worldwide in 2016 through app stores and in-app advertising, a number that will more than double by 2021, where the revenue is predicted to reach over 139 billion (Statista, 2018b).

Despite significant academic and practitioner interest, past research focused mainly on mobile app use and purchase intention (Alnawas & Aburub, 2016; Bellman, Potter, Treleaven-Hassard, Robinson, & Varan, 2011; C. L. Hsu & Lin, 2015; S. J. Kim, Wang, & Malthouse, 2015) but did not provide insights on the factors influencing in-app monetary effort. Prior research on mobile apps suggest that there is lack of analysis on the factors that influence in-app purchase (Alnawas & Aburub, 2016), resulting in a limited understanding of this phenomenon. Some of the few studies that have focused on in-app purchasing found out that the continued use (i.e. stickiness) and the consumer interaction with a mobile app are important factors that impact consumer's in-app purchase intention (C.-L. Hsu & Lin, 2016). Recent research on the topic, including discussions in the *Journal of Interactive Marketing* (e.g., Bellman et al., 2011; Kim et al., 2015, 2017; Shankar, 2016), did not examine the drivers of in-app purchase and in-app monetary effort. In this context, the research question that emerged is as follows: what are the factors that influence in-app purchase and in-app monetary effort?

This research aims to provide a greater understanding of the factors that influence in-app monetary effort. This study contributes to filling this gap by analyzing how relevant personality-based variables such as stickiness (C.-L. Hsu & Lin, 2016) and innovativeness (Gao, Rohm, Sultan, & Pagani, 2013) influence in-app purchase and monetary effort. We aim to assess the effective monetary effort of the in-app purchase rather than just the intention to purchase, as well as the analysis of the factors influencing the value that an individual spends on in-app purchases.

By doing so, this research makes three contributions to the literature on mobile applications. Firstly, this study extends the affect–behavior–cognition (ABC) model of attitudes (Jain, 2014) by developing a framework that evaluates the relevance of not only attitudes but also stickiness, satisfaction, social identification and innovativeness on mobile in-app purchase intention and monetary effort. Secondly, using a data-based approach, deemed as gap in this topic (S. J. Kim et al., 2015), we analyze factors not previously studied in this context such as innovativeness, or new perspectives on the impact of satisfaction and attitude, as well as the addition of in-app monetary effort, an empirical variable with the objective of measuring the impact of spending in mobile in-app purchases. This type of research approach was previously discussed as necessary to be developed (Alnawas & Aburub, 2016; C.-L. Hsu & Lin, 2016) and by doing it, we aim to expand the body of knowledge on this topic, reaching a deeper understanding of what motivates users to purchase within the mobile app based on empirical evidence. Thirdly, it gives important insights for brands/companies about the factors that help to explain in-app purchase intention, a factor of growing importance when talking

about the monetization of mobile apps, therefore supplying valuable information about what elements to consider when developing and deploying a mobile app with monetization purposes.

This article is structured as follows: theoretical background containing the concept of apps, in-app purchase intention, the previous research made on the topic and the theoretical foundation. Then, in the conceptual model section, it is presented the conceptual model and its hypothesis, followed by the research methodology which covers the method used in the research. The structure is then followed by data analysis and discussion, respectively. It then ends with the conclusion section.

2. THEORETICAL BACKGROUND

2.1. THE CONCEPT OF APPS AND IN-APP PURCHASE

2.1.1. The Concept of Mobile Apps

A mobile app can be defined as a software application that has been specifically developed to run on mobile, small and wireless computing devices, like tablets or smartphones (Priya Viswanathan, 2017). Mobile apps are constructed and developed by having in consideration the specifications of mobile devices, to maximize the capabilities they can offer. Usually, there are three categories for mobile apps: 1) Web-based, specifically made for web browsers; 2) Native, developed in particular for a specific device/platform; 3) Hybrid, combining elements of both the aforementioned categories (Rouse, 2013).

2.1.2. In-App Purchase Intention

We can define purchase intention as the likelihood that consumers will be willing to purchase, either a product or service, in the future (Wu, Yeh, & Hsiao, 2011). In previous research, the intention to purchase was confirmed to be positively correlated with the chance to make an actual purchase (Schiffman & Kanuk, 2007). In mobile apps context, purchase intention has been described as the willingness of purchasing paid apps, pay for additional features, to remove adds, or to establish in-app purchases (C. L. Hsu & Lin, 2015; Vigário, Neto, Fonseca, Freire, & Inácio, 2015). In the specific case of in-app purchases, if can be defined as the act of purchasing digital products or services within a mobile app (C.-L. Hsu & Lin, 2016). In this work, in-app purchasing includes the buying of products and services through an app via mobile device.

2.2. PRIOR RESEARCH ON IN-APP PURCHASE

Previous research analyzed how the use of contexts on a relationship between value components and perceived value can be used to determine perceived value, loyalty and satisfaction of mobile apps (C. Chang, 2015). This study suffered from limitations resulting from the fact that only one app was used and that the moderate use of contexts can influence the antecedents of value. It was also studied whether using popular mobile apps would affect brand attitude and purchase intention. The results proved that the use of mobile apps has an influence on raising attention and interest in the brand and its product category (C.-L. Hsu & Lin, 2016). Information based apps were more effective in directing purchase intention than product category (Bellman et al., 2011). Recent research analyzed how consumers spending levels change after using a branded app, concluding that app adoption and continued use of the app are main factors that impact future spending levels, suggesting in an overall analysis that apps can be a persuasive tool used for marketing purposes to reach the consumer (S. J. Kim et al., 2015). The benefits obtained from the interaction of branded mobile apps with consumer satisfaction and purchase intention were also studied. Four benefits based on the interaction between consumer and brand were specified: learning benefits, social integrative benefits, personal integrative benefits and hedonic benefits (Alnawas & Aburub, 2016). Previous work proved that there is a positive relationship between consumer satisfaction and purchase intention in mobile app context (Alnawas & Aburub, 2016).

2.3.1. Affect–Behavior–Cognition (ABC) Model of Attitudes

The affect–behavior–cognition (ABC) model of attitudes is a model that tries to explain attitude with a basis of three components: affective, behavioral, cognitive. The affective elements involve the feelings of the individual when executing the action in analysis. The behavioral component relates to how attitude influences the individual's behavior towards the action, based on affect and cognition. The cognitive component is about the beliefs and knowledge of the individual about the action (Dean, 2010).

Attitude can be a classifier of the evaluation made by the individual towards a specific product or service (Solomon, 1992), as well as an element that affects shopping habits of the individual. Attitude is an agglomeration of beliefs, feelings and behavioral intentions towards a certain subject. A consumer can hold a certain positive or negative belief or feeling towards a product or service (Dean, 2010).

In past years, there were many theories that have adapted the cognition affect behavior causal chain to predict user behavior, such as the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM). TRA states the individual behavior intention helps to determine the individual effective behavior and that behavior intention is determined by the attitude of the individual towards the behavior and subjective norms concerned with the behavior (Fishbein & Ajzen, 1975). TBP states that behavior is determined by intention, which is preceded by attitude, subjective norms and perceived behavioral control (Ajzen, 1991). TAM determines perceived ease of use and perceived usefulness as important to explain user attitude towards IT acceptance and behavior (Davis, 1989). The ABC model does not specify beliefs for any particular behavior. As such, while ABC model has been used to explain user behavior, there needs to be a specific consideration for the specific context in what regards beliefs and behavior, for attitude formation is related to the characteristics of the product or service in analysis.

3. CONCEPTUAL MODEL

3.1. THE CONCEPTUAL MODEL

The presented conceptual model is based on the ABC model of attitudes, primarily based on the model of Lin (C.-L. Hsu & Lin, 2016), that already presented a representation of the ABC Model on this particular subject. We suggest innovativeness, social identification, attitude, and stickiness as determinants of purchase intention. We also define innovativeness, stickiness, and purchase intention as determinants of in-app monetary effort, a new variable that was added to empirically prove the impact of spending on in-app purchasing. Our model also explores the impact that both attitude and satisfaction can have as moderators on the relationship between stickiness and purchase intention on in-app monetary effort. With this model, we expect to have robust, strong results about the effective spending on in-app purchasing, something that has not been tested yet. Hence, we will have better conclusions about the main factors involving mobile apps and in-app purchasing.

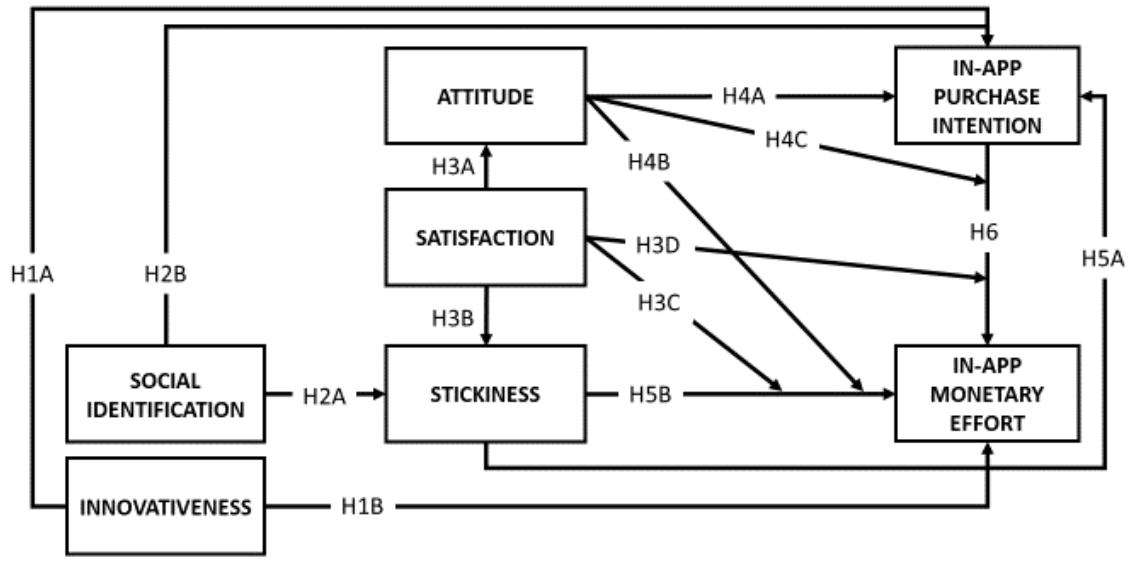

Figure 1 – Conceptual Model

3.2. HYPOTHESES

Innovativeness can be described as a personality trait characterized as the willingness to use new products and/or services (Goldsmith & Hofacker, 1991; I. Ajzen and M. Fishbein, 1980; Pagani, 2004). Research regarding innovativeness and its outcomes proved to be important in similar contexts, such as mobile marketing (Gao et al., 2013), product adoption (Goldsmith & Hofacker, 1991), and purchase intention (Flynn & Goldsmith, 1993). In previous research, it was proved that innovativeness positively influences attitude towards technology use (Gao et al., 2013). Personality-like variables such as innovativeness are a gap to fill on research in the context of mobile apps (Alnawas & Aburub, 2016). Costumer innovativeness has been confirmed by previous research to be a strong personality antecedent in motivating buyers to purchase a product or service (Im, Bayus, & Mason, 2003), and have a positive relation with the use and adoption of technologies (Im et al., 2003). Also, innovativeness has strong impact in the user perception of buying products or services in

terms of mobile commerce (Lu, 2014). Having in consideration the evidence that innovativeness is impactful in terms of purchase intention and mobile purchasing, we believe that the innovative use of mobile app features towards the user may influence its perception of mobile app use and consequent purchasing. Thus, we expect innovativeness to have a strong impact in terms of mobile apps and have a positive impact both on in-app purchase intention and in-app monetary effort.

H1: Consumer innovativeness will positively affect in-app purchase intention (H1a) and will positively affect in-app monetary effort (H1b).

Social identification can be characterized as the sense of belonging within a group of individuals, where the individual *"defines him or herself in terms of their membership in a particular organization"* (Mael & Ashforth, 1992, p. 105). This situation occurs when an individual identifies themselves with the actions, feelings or thoughts of a group, acting accordingly. Many social theories describe the act of social identification as the classification of social entities as groups, to which an individual engages to establish structured relations that form a pattern of behaviors of social identities (Ashforth & Mael, 1989). Social identification is a self-concept created to explain the association of certain emotions and standards to a specific group and favor the individual's well-being (Haslam, Jetten, Postmes, & Haslam, 2009). Previous studies show that social identification is an important factor when considering mobile app use and purchase intention (C.-L. Hsu & Lin, 2016), as well as a relevant psychological variable to explain continued use of mobile phone and its relation between the public image a user has with its peers (Walsh, White, & Young, 2009). Based on previous research, in this work we believe that social identification impacts how much a user is willing to use and purchase in a mobile app, to feel part of the social group of its peers and act accordingly. Thus, we expect in this context to explore the impact social identification has on stickiness and in-app purchase intention.

H2: Social identification will positively affect user stickiness (H2a) and will positively affect user intention to make in-app purchases (H2b).

Satisfaction can be described as the affective response that evaluates how the final product or service fulfills the expectations posed by the user on them (Lee, Lee, & Feick, 2001). Previous research showed that a having a high consumer satisfaction has a positive impact on consumer's attitude towards purchase intention and, as a consequence, higher gains for the firms (Srivastava & Sharma, 2013). Other studies on very similar contexts showed that consumer interaction with mobile apps can be an essential source to shape consumer satisfaction and future purchase intention (Alnawas & Aburub, 2016). Satisfaction has a strong relationship with purchase intention (Cronin & Taylor, 1992). In the context of this work, satisfaction can be defined as the relationship between the user expectations for the product or service deployed by the app and their outcome. Based on the importance that satisfaction proved to have in terms of explaining purchase intention, we find relevant to consider the impact that user satisfaction can have as an influencer between stickiness and intention to purchase on the money that is spent in those purchases.

H3: Satisfaction will positively affect user attitude (H3a) and will positively affect user stickiness (H3b). Satisfaction will moderate the effect of stickiness on in-app monetary effort (H3c) and will moderate the effect of in-app purchase intention on in-app monetary effort (H3d).

Davis and colleagues defined attitude as the feeling generated by the use of a system, either positive or negative (Davis, Fred D.Bagozzi, Richard P.Warshaw, 1989). In similar contexts, attitude has proven to be an important factor to explain technological uses (Al-Gahtani & King, 1999), mobile advertising (Feng, Fu, & Qin, 2016) and mobile marketing (Watson, McCarthy, & Rowley, 2013). Attitude can be defined in this context as the degree to which the consumer feels positively about in-app purchasing and the monetary effort made on those purchases. Previous research on attitude and satisfaction has proved that both these elements are highly correlated (Ajzen, 1991; Fishbein & Ajzen, 1975; Fornell, 1992), which was confirmed by studies in more specific contexts, where both those factors were important and preceded purchase intention, such as in online shopping (Abdul-Muhmin, 2011). Once that attitude has shown to be important in terms of purchase intention analysis and also plays a great role in explaining stickiness (C.-L. Hsu & Lin, 2016), we consider important to analyze the role attitude can have as a moderator in the relationships between stickiness and purchase intention on in-app monetary effort.

H4: Attitude will positively affect in-app purchase intention (H4a). Attitude will moderate the association between stickiness and in-app monetary effort (H4b) and the association between in-app purchase intention and in-app monetary effort (H4c).

Stickiness has been defined as the degree to which a website can retain its users (Demers & Lev, 2000). More recently, in the context of mobile apps, it was proposed that stickiness can be considered "the degree to which a user re-uses a given app and prolongs the duration of each usage" (C.-L. Hsu & Lin, 2016, p. 45). Stickiness has previously been studied as important to determine usage intentions (M. K. Chang & Cheung, 2001; Huang & Lin, 2011; Lien, Cao, & Zhou, 2017), and in similar contexts of purchase intention (Lin, 2007) and smartphone user attachment (Fullwood, Quinn, Kaye, & Redding, 2017). We thus consider stickiness to be the users' intention to utilize a mobile app as part of their normal activities or an embedded routine where they are constantly purchasing through a mobile app.

H5: Stickiness will positively affect user intention to in-app purchase (H5a) and will positively affect in-app monetary effort (H5b).

In previous research, the intention has been defined as a construct that precedes effective behavior (Ajzen, 1991; Fishbein & Ajzen, 1975). Purchase intention has been considered an important antecedent for actual purchasing, and many studies tried to analyze the factors that influence it in a various range of similar contexts, such as online shopping (Abdul-Muhmin, 2011; Posselt, 2005), in-store product purchases (Kowatsch & Maass, 2010), use of branded mobile apps (Alnawas & Aburub, 2016; S. J. Kim et al., 2015), mobile games (Hsiao & Chen, 2016), or social commerce websites (Ng, 2013). In line with these studies, we mean not only to study in-app purchase intention but also the effective behavior of in-app purchase and its effective value, through in-app monetary effort.

H6: In-app purchase intention will positively affect in-app monetary effort.

4. METHOD

4.1. MEASUREMENT

All the constructs presented were based on the constructs from the previous works referenced in the theoretical background or adapted with slight modifications so that the items are more adequate to the context of mobile apps. It was used 1- to 7-point scales, with 1 being "totally disagree" and 7 "totally agree", as well as some open questions regarding monetary values. The changes in the adapted constructs were mostly semantic, allowing a more direct understanding and interpretation that the main subject is about mobile apps (see Appendix A). One of the constructs, in-app monetary effort, was created to fill the quantitative gap on the topic, as deemed as necessary on previous research. It was also included 4 demographic variables: gender, age, education, job.

4.2. DATA

The first stage of data collection was through the test of a pilot-survey, with 27 complete answers, from 9 January 2018 through 12 January 2018. In this stage, the main goal was to test the items presented in the questionnaire, how well the structure of the survey worked and how many of the items would be relevant to the final survey. The main criticism registered from the users was related to the extension of the questionnaire, which couldn't be reduced because of how important all the items proved to be. Therefore, the final survey was practically equal to the pilot-survey. The pilot data was not included in the final analysis.

The second and final stage of data collection was done with an online survey to test the hypotheses in this study. The survey was conducted in the first semester of 2018. The data of the survey was collected from European consumers who use mobile apps regularly. In total, 546 respondents answered the survey, with 303 complete answers. We did not consider incomplete answers for the final results. The questionnaires were administered to people residing in a European country, Portugal, and the sample was constituted of 303 consumers. There are two ways to examine the common method bias. The first method is Harman's one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In the study, no factor explains the major part of the variance individually, as the bigger factor explains only 40.5%. The second method is through the marker variable approach (Lindell & Whitney, 2001), where is added to the research model a theoretically irrelevant marker variable. By comparing with the value shared with other variables, the maximum shared variance value obtained in the research model for this irrelevant variable was 3.9%. We consider this value as being low (Johnson, Rosen, & Johnson, 2011). Therefore, we found no significant common method bias.

Of the 303 respondents (see Table 1) 167 (55%) were male and 136 (45%) were female. The age average of the individuals was 34, with the youngest respondent being 17 and the oldest 75. The most representative age range is from 20 to 29 years old with 42%, almost half of the respondents. The second most representative age range is 30 to 39 years old, with 23%, followed by 40 to 49 years old, with 19%. Regarding educational levels, almost half of the people inquired have at least a bachelor's degree (45%), existing also a strong representation of people with a master's degree (32%). Most of the inquiries are employed (83%). Almost ¾ of the respondents (73%) have a strong knowledge of mobile apps and its use.

Measure	Item	*N*	%
Gender	*Male*	167	55.1
	Female	136	44.9
Age	*Under 20*	11	3.6
	20-29	128	42.2
	30-39	71	23.4
	40-49	57	18.8
	50-59	27	8.9
	59+	9	3.0
Education	Elementary School	4	1.3
	High school	55	18.2
	Graduate	137	45.2
	Master	97	32.0
	Doctorate	9	3.0
	Doesn't Say	1	0.3

Measure	Item	*N*	%
Job Status	*Student*	38	12.5
	Employed	227	74.9
	Self-employed	25	8.3
	Unemployed	5	1.7
	Retired	8	2.6

Table 1 - Survey respondent profile (n=303)

5. RESULTS

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to empirically test the conceptual model. SEM is widely recognized as a statistical technique that tests and evaluates possible causal relations among a group of variables by combining quantitative methods with data (Henseler, J., Ringle, C. M., & Sinkovics, 2009). The factors considered to use Partial Least Squares (PLS) were: (i) The research model has not been tested in previous work; (ii) the presented conceptual model is one with a high level of complexity. In order to analyze the outcomes of the conceptual model, we used the software Smart PLS 3.0 (Ringle, Wende, & Becker, 2015). This section is divided into two parts. In the first part the measurement model is examined to evaluate indicator reliability, construct reliability, convergent validity, and discriminant validity. In the second part, we evaluate the structural model.

5.1. MEASUREMENT MODEL

The measurement model is necessary to verify reliability and validity of the instrument, its indicators and constructs. In order to have an indication of the reliability of the indicators, the values of the loadings should be higher than 0.7 (Chin, 1998b; Hair & Anderson, 2010; Henseler, J., Ringle, C. M., & Sinkovics, 2009). We can conclude that every item except two who are slightly below, IME1 and IME4, has loading values superior to 0.7 (Please see Table 2). Therefore, we have internal consistency and we can conclude that indicator reliability has been achieved.

Constructs	Loadings	CR	CA	AVE
Innovativeness (IN)		0.939	0.902	0.836
IN1	**0.891**			
IN2	**0.929**			
IN3	**0.922**			
Social Identification (SID)		0.879	0.817	0.646
SID1	**0.822**			
SID2	**0.803**			
SID3	**0.836**			
SID4	**0.752**			
Satisfaction (SF)		0.962	0.948	0.865
SF1	**0.888**			
SF2	**0.947**			
SF3	**0.962**			
SF4	**0.922**			
Attitude (ATT)		0.888	0.809	0.725
ATT1	**0.904**			
ATT2	**0.863**			
ATT3	**0.784**			
Stickiness (STK)		0.891	0.837	0.672
STK1	**0.810**			
STK2	**0.826**			
STK3	**0.821**			
STK4	**0.821**			
In-app Purchase Intention (IAP)		0.967	0.954	0.879
IAP1	**0.937**			
IAP2	**0.939**			
IAP3	**0.928**			
IAP4	**0.948**			
In-app Monetary Effort (IME)		0.794	0.602	0.567
IME1	**0.691**			
IME3	**0.798**			
IME4	**0.688**			

Table 2 - Factor loading, composite reliabilities, Cronbach alpha and average variance extracted (n=303)

We then need to verify if two of the most important criterions to examine construct's reliability – Cronbach's Alpha (CA) and Composite Reliability (CR) – are present and valid. The most frequently used is Cronbach's Alpha, which provides an estimation for reliability based on the intercorrelations of the presented indicators, which are assumed to be equally reliable (Henseler, J., Ringle, C. M., &

Sinkovics, 2009). As we can verify with greater detail in Table 2, in Cronbach's Alpha, all the constructs present values higher than 0.7 except for the construct In-app monetary effort, which shows a value lower than 0.7. This can be explained by the fact that this variable is new and based on real values. Based only on Cronbach's Alpha we cannot affirm that the construct in-app monetary effort has reliability, unlike every other construct, according to the construct reliability criterions required (Henseler, J., Ringle, C. M., & Sinkovics, 2009). Composite Reliability measures the internal consistency of each given construct and the extent to which the items represent underlying constructs. Composite Reliability considers the different loading values for each construct, unlike Cronbach's Alpha. Consequently, it is more suitable for PLS use, once that in PLS the constructs are prioritized based on their individual reliability. To have a construct considered valid, Composite Reliability has to be higher than 0.7 (Henseler, J., Ringle, C. M., & Sinkovics, 2009). All the constructs present higher values than 0.7 in Composite Reliability, which confirms construct reliability (please see Table 2).

Finally, to have convergent validity we need to verify if the average variance extracted (AVE) is at least 0.5, in order for the latent variables to be considered valid in explaining, on average, more than half the variance of the present indicators (Hair & Anderson, 2010; Henseler, J., Ringle, C. M., & Sinkovics, 2009). As can be seen in Table 2, the convergent validity of the constructs is confirmed in every construct.

There are three criterions for discriminant validity. The first is the Fornell-Larcker criterion, that infers the root square of AVE where every latent variable must have a greater value than the correlation with any other latent variable (Fornell & Larcker, 1981). We can see in Table 3 that the condition is valid. The second criteria suggests that the value of loadings should be higher than the value of cross-loadings (Chin, 1998b). This criterion is also verified in this work (see Appendix B). Finally, the third criterion is Heterotrait-Monotrait Ratio (HTMT), a more effective approach to evaluate discriminant validity based on the multitrait-multimethod matrix. HTMT is the average of the heterotrait-heteromethod correlations relative to the average of the monotrait-heteromethod correlations. We can affirm that discriminant validity is established between two reflective constructs if the value of HTMT is below 0.9 (Henseler, Ringle, & Sarstedt, 2014). This criterion is confirmed (please see Table 4). Therefore, we can affirm that there is strong enough evidence to prove discriminant validity.

	Mean	SD	IN	SID	SF	ATT	STK	IAP	IME
Innovativeness (IN)	3.498	1.720	**0.914**						
Social Identification (SID)	4.384	1.398	0.384	**0.804**					
Satisfaction (SF)	4.167	1.538	0.478	0.541	**0.930**				
Attitude (ATT)	5.352	1.386	0.405	0.470	0.549	**0.852**			
Stickiness (STK)	4.232	1.374	0.501	0.496	0.681	0.569	**0.820**		
In-app Purchase Intention (IAP)	4.328	1.751	0.516	0.461	0.533	0.652	0.591	**0.938**	
In-app Monetary Effort (IME)	9.375	19.143	0.310	0.052	0.135	0.203	0.259	0.316	**0.753**

Table 3 - AVE and correlations

	IN	SID	SF	ATT	STK	IAP	IME
Innovativeness (IN)							
Social Identification (SID)	0.443						
Satisfaction (SF)	0.515	0.615					
Attitude (ATT)	0.472	0.583	0.626				
Stickiness (STK)	0.576	0.593	0.764	0.686			
In-app Purchase Intention (IAP)	0.554	0.520	0.561	0.735	0.660		
In-app Monetary Effort (IME)	0.418	0.158	0.174	0.281	0.363	0.414	

Table 4 - Heterotrait-Monotrait Ratio Matrix

5.2. STRUCTURAL MODEL

The measurement model has been previously assessed as satisfactory. We can now test the structural model. This study resorted to the use of a bootstrap estimation of resampling of 5.000, in order to assess the statistical significance of the path coefficients (Chin, 1998a). The coefficient of determination (R2) measures how much the endogenous latent variables help to predict the model, its predictive accuracy. For an R^2 to be considered good, it should be higher than 0.2 (Chin, 1998b). Only in-app monetary effort has a value slightly below 0.2, which is acceptable due to the nature of the variable, new and based on real values. The results are presented in Figure 2. To assess if we have multicollinearity in the structural model, we must analyze the variance inflation factor (VIF), which is an indicator for how much the precision of the model is impacted by multicollinearity. Values above 10 mean that the correlations are significant enough to be problematic for the regression analysis (Hair & Anderson, 2010). In this work, the VIF values vary from 1.0 to 3.4. Even though the highest value is slightly above the recommended threshold of 3.3 (Diamantopoulos & Siguaw, 2006), it is still below the more conservative value of 5 (Markus, 2012). We can conclude that there is no multicollinearity problem with the data.

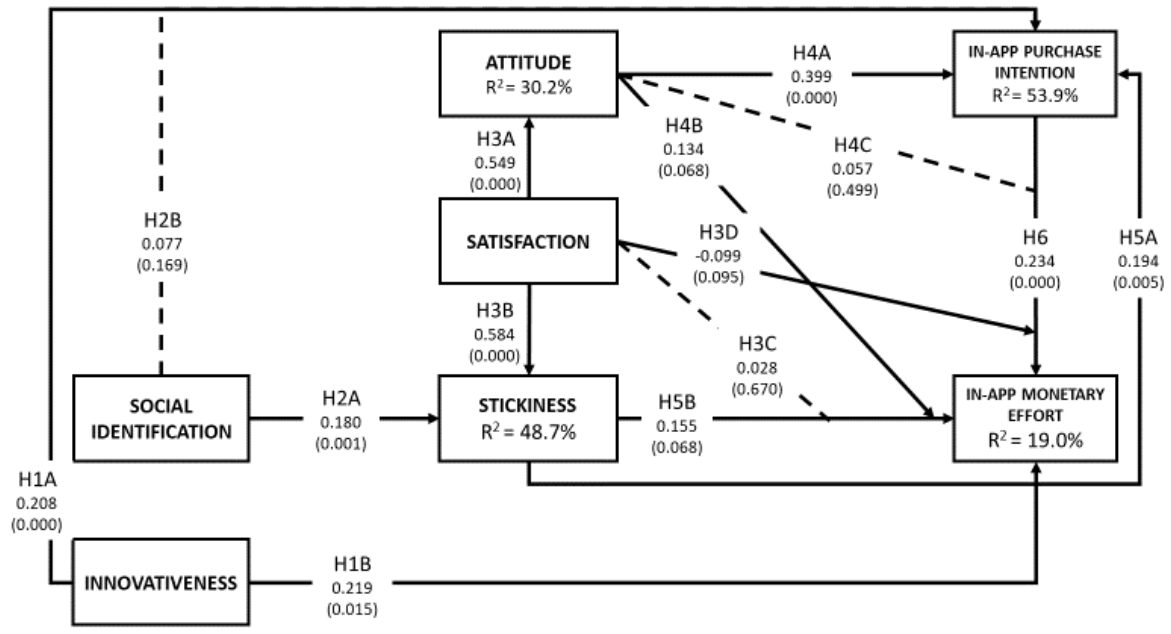

Figure 2 - Structural model results with path coefficients, r squares and p-values (between parentheses)

Attitude variation is explained by 30% of the endogenous variables of the conceptual model. The hypothesis of satisfaction ($\hat{\beta}$ = 0.549; p < 0.05) is statistically significant. Hypothesis 3A is supported.

The presented model explains 48.7% of the variation in stickiness value. The hypothesis of social identification ($\hat{\beta}$ = 0.180; p < 0.05) and satisfaction ($\hat{\beta}$ = 0.584; p < 0.05) are both statistically significant, supporting H2A and H3B.

The conceptual model explains 53.9% of the variation in in-app purchase intention. The hypothesis of innovativeness ($\hat{\beta}$ = 0.208; p < 0.05), attitude ($\hat{\beta}$= 0.399; p < 0.05) and stickiness ($\hat{\beta}$ = 0.194; p < 0.05) are all statistically significant. We can conclude that hypothesis H1A, H4A and H5A are supported. Social identification ($\hat{\beta}$ = 0.077; p > 0.05) is not statistically significant to explain in-app purchase intention. Hypothesis H2B is not supported.

The variation of the conceptual model explains 19.0% of in-app monetary effort. In-app monetary effort is a new variable based on real behavior, so we accept having a R^2 value slightly below 20%. The hypothesis of innovativeness ($\hat{\beta}$ = 0.219; p < 0.05), stickiness ($\hat{\beta}$ = 0.155; p < 0.1) and in-app purchase ($\hat{\beta}$ = 0.234; p < 0.05) are statistically relevant. As such, hypothesis H1B, H5B and H6 are supported.

The moderating effect of satisfaction ($\hat{\beta}$ = -0.099; p < 0.1) between in-app purchase intention and in-app monetary effort is statistically significant. However, satisfaction as a moderator ($\hat{\beta}$ = 0.028; p > 0.05) between stickiness and in-app monetary effort is not statistically significant. As such, hypothesis H3D is supported but H3C is not.

The moderation role of attitude ($\hat{\beta}$ = 0.057; p > 0.05) between in-app purchase intention and in-app monetary effort is not statistically significant. Therefore, hypothesis H4C is not supported. However, attitude as a moderator ($\hat{\beta}$ = 0.134; p < 0.1) between stickiness and in-app monetary effort is statistically significant. Hypothesis 4B is supported.

We can conclude that out of the 14 hypotheses to test in this study, 11 are supported and 3 are not.

6. DISCUSSION

We can verify the importance of innovativeness in terms of mobile in-app purchasing and the spending in purchases. Innovativeness is a factor that positively influences the intention to make in-app purchases and the money spent in mobile in-app purchasing. An innovative way of promoting in mobile apps depends on several factors that should be considered, such as value-privacy tradeoff, social media or spatiotemporal targeting (Shankar, 2016). The use of new promotion features is relevant and should be taken into consideration, supporting previous work suggesting that the use of original and practical features helped to promote use (Gao et al., 2013). It is important to have well implemented features that are adaptable to the device that runs them (Noei, Syer, Zou, Hassan, & Keivanloo, 2017), once that investing in such actions will increase the user perception of the app.

Our model confirms that social identification also plays an important role as a positive influence on the stickiness intention people have with mobile apps. The more the individual feels that the use of mobile apps makes him part of a group, the more he will use mobile apps. This strengthens the notion that brands should focus on their identity within their mobile app towards their target consumers, who can turn into ambassadors for the brand (He, Chen, Lee, Wang, & Pohlmann, 2017). This study fails to prove the effect that social identification has on purchase intention (see Table 5), which means that people do not go as far as purchasing in a mobile app for the sake of feeling part of a certain group or do not consider purchasing a strong enough factor to be an identifying factor to make them part of a social pattern.

Satisfaction positively affects attitude towards the use of mobile apps for purchasing, as well as stickiness intention of mobile app use, which corroborates previous research (Barwitz & Maas, 2018). We can affirm that the more satisfied a user is with the use of mobile apps, the more likely he is to spend time with them and have a positive attitude towards in-app purchasing. We shed some new light on the subject of mobile in-app purchasing and spending, for in this research we verify that satisfaction moderates the relationship between in-app purchase intention and monetary effort (Figure 3a). Based on real data, we now have empirical information that in a lower satisfaction context towards mobile app use, the importance of in-app purchase intention in explaining in-app monetary effort increases. The study failed to conclude the effect of satisfaction as a moderator between stickiness and in-app monetary effort (see Table 5, that summarizes the hypotheses conclusion).

Hypo-theses	Independent Variables	Dependent Variables	Findings	Results
H1a	Innovativeness	In-app Purchase intention	Positive and statistically significant ($\hat{\beta}$ = 0.208; $p < 0.05$)	Supported
H1b		In-app Monetary Effort	Positive and statistically significant ($\hat{\beta}$ = 0.219; $p < 0.05$)	Supported
H2a	Social Identification	Stickiness	Positive and statistically significant ($\hat{\beta}$ = 0.180; $p < 0.05$)	Supported
H2b		In-app Purchase intention	Positive and statistically significant ($\hat{\beta}$ = 0.077; $p > 0.05$)	Not Supported
H3a	Satisfaction	Attitude	Positive and statistically significant ($\hat{\beta}$ = 0.549; $p < 0.05$)	Supported
H3b		Stickiness	Positive and statistically significant ($\hat{\beta}$ = 0.584; $p < 0.05$)	Supported
H3c		Stickiness → In-app monetary effort	Positive and statistically significant ($\hat{\beta}$ = 0.028; $p > 0.05$)	Not supported
H3d		In-app Purchase intention → In-app monetary effort	Negative and statistically significant ($\hat{\beta}$ = -0.099; $p < 0.1$)	Supported
H4a	Attitude	In-app Purchase intention	Positive and statistically significant ($\hat{\beta}$ = 0.399; $p < 0.05$)	Supported
H4b		Stickiness → In-app monetary effort	Positive and statistically significant ($\hat{\beta}$ = 0.134; $p < 0.1$)	Supported
H4c		In-app Purchase intention → In-app monetary effort	Positive and statistically significant ($\hat{\beta}$ = 0.057; $p > 0.05$)	Not Supported
H5a	Stickiness	In-app Purchase intention	Positive and statistically significant ($\hat{\beta}$ = 0.194; $p < 0.05$)	Supported
H5b		In-app Monetary Effort	Positive and statistically significant ($\hat{\beta}$ = 0.155; $p < 0.01$)	Supported
H6	In-app Purchase Intention	In-app Monetary Effort	Positive and statistically significant ($\hat{\beta}$ = 0.234; $p > 0.05$)	Supported

Table 5 - Hypotheses summary

The results of our model suggest that attitude is very important for purchase intention. The more positively a user feels with mobile apps use and purchasing, the more probable it is to effectively make a purchase. A positive attitude towards a mobile app is important for a good attitude towards the brand behind it (Vanmeter, Syrdal, Powell-mantel, Grisaffe, & Nesson, 2018). In our work, attitude doesn't have any significant moderating effect between in-app purchase intention and the monetary effort of those purchases (See Table 5). However, we empirically prove that attitude positively moderates the impact stickiness has on in-app monetary effort (Figure 3b). By doing so, we reach new ground on the subject regarding a new-found importance of attitude in mobile app purchasing context. We can affirm that in a context of higher attitude towards mobile app use, the importance of stickiness in explaining in-app monetary effort is consequently higher.

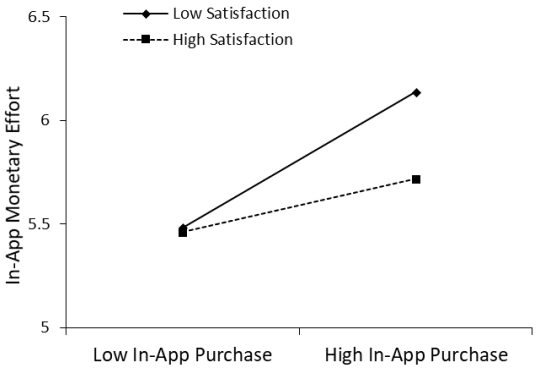

Figure 3a – Moderating effect of satisfaction between in-and purchase and in-app monetary effort

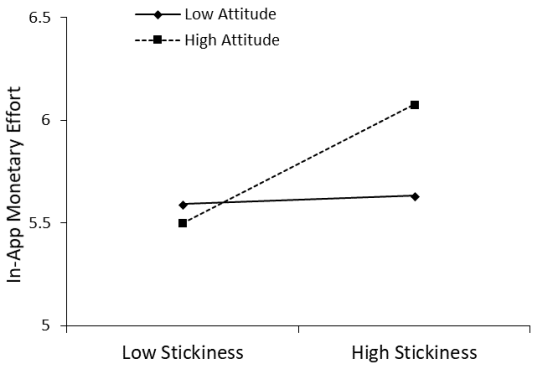

Figure 3b – Moderating effect of attitude between stickiness and in-app monetary effort

This study finds that stickiness has an important role not only in terms of explaining purchase intention on mobile apps, but also the spending made on those purchases. We now have new evidence showing the more a user spends time in a mobile app, the more likely he is to be inclined to make a purchase in mobile apps and, consequently, more willing to spend on mobile in-app purchases.

Finally, we tested and proved one of our main assumptions in this study, that purchase intention precedes and explains monetary effort. We have now proof that the more a user intends to in-app purchase, the more he is willing to spend on in-app purchasing. This conclusion adds up to the reasoning in previous research (Holloway, Wang, & Parish, 2005), where mobile users are considered the better target for promoting purchasing behavior (M. Kim, Kim, Choi, & Trivedi, 2017). This proves one of our main goals in this work and expands the information made on the topic.

6.1. MANAGERIAL IMPLICATIONS

The findings in this study will have several practical contributions. First, the importance of focusing on important aspects in terms of mobile app use is important, as confirmed by the importance of satisfaction on attitude and stickiness. Features and characteristics related to user interface and user experience may be helpful in terms of engaging with regular users and new ones (Cyr, Head, & Ivanov, 2006; Yee, Qi, Yong, Wee, & Yee, 2015). Helping to facilitate ease of use of the app will, therefore, make the user feel satisfied when using the app, which will then improve their perception of the mobile app and encourage its use more often (Sheng & Teo, 2012). Also, in-app innovation is something to consider for keeping the user updated and interested in possible in-app purchases. Using strong visual call to action elements, such as careful color selection and elaborated design may motivate the use of the mobile app (Hsieh, Chiu, Tang, & Lee, 2018).

Second, we also verify that the more people use continuedly an app, the more it will incentive its peers to use them as well, which is a proof of the importance that social identification has in app adoption and use. When a user is satisfied, the word of mouth will be positive (Jung & Seock, 2017). Brands or companies that learn how to explore word-of-mouth properly and to communicate with their target consumer will have competitive advantage in order to sell their products or services through mobile apps (Shankar et al., 2016). Investing in the social component of a mobile app may be a key factor to create buzz around an app and promote its use effectively for the target consumer, through word-of-mouth among members of those target groups (Zhao & Balagué, 2015), as well as

increasing a sense of familiarity which helps to increase trust and consequently purchase intentions (Hajli, Sims, Zadeh, & Richard, 2017).

Finally, the fact that satisfaction has a negative correlation with in-app purchase intention and in-app monetary effort is a sign that users may buy a product or service once and not consider spending much more on future purchases than they have spent thus far. Mobile apps who are focused on selling products or offering services do not positively impact the perception of use that users have of them. Product and service-oriented apps must have the previously mentioned elements in consideration to engage with their users more effectively, once that experience is important to make the user satisfied (Liao, Lin, Luo, & Chea, 2017).

6.2. LIMITATIONS AND FUTURE RESEARCH

This study adds valuable knowledge to the mobile apps literature. However, it has some limitations that should be addressed in future research. First, this research was conducted in a western European country. As such, it must be taken into consideration the cultural characteristics of that context and the social and economic reality elements that are part of it. In future work, it would be interesting to study the same topic in other social, economic and cultural contexts. Second, although it was concluded the importance of how much an individual spends on in-app purchases has in the subject of mobile apps and its engagement with the user, further research can focus on the different kinds of products and services that can be more effective to sell on a mobile app. Lastly, it would be interesting to understand if in-app purchase intention and in-app monetary effort could be indicators of an effective way for some specific niche brands to sell their products or services exclusively in a mobile app.

7. CONCLUSIONS

Mobile apps are growing in terms of importance, especially as a channel to increase purchases and consumers' monetary effort. This work provides insights on the importance of in-app purchasing and contributes to the understanding of the factors that influence consumers to purchase in apps and the monetary effort spent within it.

The main drivers that impact in-app purchase intention are innovativeness, attitude and stickiness. The main drivers that impact in-app monetary effort are innovativeness, stickiness and in-app purchase intention. Both attitude and satisfaction proved to be important moderators. Attitude moderates the relationship between stickiness and in-app monetary effort and satisfaction moderates the relationship between in-app purchase intention and in-app monetary effort.

Our findings suggest that the more users use mobile apps, the more they are willing to buy and spend considerably through mobile apps. This is motivated by how well the app is optimized for them both in terms of functionality and offers, something that product/service oriented focused apps should consider. Social identification and innovativeness should be taken into great consideration because these are essential factors related with the communication for the target audience, important for advocating users to spend time on an app and to purchase. We can affirm that the analysis of personality factors such as attitude, stickiness, social identification and innovativeness and their impact on the spending on in-app purchases adds to the body of knowledge on the topic of mobile apps, specifically in terms of monetary value impact.

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9. APPENDIXES

9.1. APPENDIX A – INSTRUMENT

Constructs	Code	items	Reference
Social Identification (SID)	SID1	Using Mobile Apps would enhance my chance to meet people with whom I share common interests.	(adapted from Hsu & Lin, 2016)
	SID2	I am proud to be a member of the Mobile Apps community.	
	SID3	Using Mobile Apps gives me a strong feeling of belonging to a group.	
	SID4	Mobile Apps are a communication channel, allowing users to maintain close ties and share information	
Innovativeness (IN)	IN1	When choosing what Mobile Apps to download, other people often turn to me for advice.	(Gao et al., 2013)
	IN2	I often recommend new Apps (e.g., games, entertainment guides, brand-specific applications) available on mobile phone.	
	IN3	I often send my friends information on new Apps for their mobile phone.	
Attitude (ATT)	ATT1	I like the idea of using Mobile Apps to purchase products or services.	(Gao et al., 2013)
	ATT2	Mobile Apps could be a good way for me to access information about things to do and places to go at anytime, anywhere.	
	ATT3	I would enjoy receiving coupons or other offers and incentives on Mobile Apps.	
Satisfaction (SF)	SF1	Using Mobile Apps makes me feel very satisfied.	(adapted from Hsu & Lin, 2016)
	SF2	Using Mobile Apps gives me a sense of enjoyment.	
	SF3	Using Mobile Apps makes me feel very contented.	
	SF4	Using Mobile Apps makes me feel very delighted.	
Stickiness (STK)	STK1	I would stay longer on Mobile Apps than other mobile technologies	(adapted from Hsu & Lin, 2016)
	STK2	I intend to spend more time on Mobile Apps.	
	STK3	I use Mobile Apps as often as I can.	
	STK4	I use Mobile Apps every time I am online.	
In- App Purchase Intention (IAP)	IAP1	I intend to continue purchasing in-app products and services.	(C.-L. Hsu & Lin, 2016)
	IAP2	I strongly recommend others to purchase in-app products and services.	
	IAP3	I find purchasing in-app products and services to be worthwhile.	
	IAP4	I will frequently purchase in-app products and services in the future.	
In-App Monetary Effort (IME)	IME1	How much do you spend on in-app purchases?	
	IME2	What was the maximum you spent on a single in-app purchase?*	
	IME3	How many times do you purchase a product/or service through a mobile app?	
	IME4	How many times have you downloaded an app just to exclusively make a purchase?	

Note: *Item eliminated due to low loading.

9.2. APPENDIX B – LOADINGS AND CROSS-LOADINGS

Items	IN	SID	SF	ATT	STK	IAP	IME
IN1	**0.892**	0.371	0.390	0.348	0.426	0.440	0.278
IN2	**0.928**	0.358	0.461	0.393	0.448	0.475	0.236
IN3	**0.922**	0.328	0.457	0.371	0.496	0.497	0.330
SID1	0.285	**0.822**	0.389	0.455	0.375	0.421	0.107
SID2	0.354	**0.802**	0.525	0.371	0.416	0.312	-0.059
SID3	0.372	**0.836**	0.455	0.311	0.466	0.402	0.053
SID4	0.209	**0.753**	0.372	0.384	0.326	0.339	0.060
SF1	0.420	0.501	**0.888**	0.592	0.615	0.462	0.143
SF2	0.460	0.536	**0.947**	0.522	0.646	0.516	0.115
SF3	0.462	0.483	**0.962**	0.490	0.646	0.506	0.127
SF4	0.434	0.491	**0.922**	0.434	0.626	0.499	0.115
ATT1	0.387	0.411	0.490	**0.903**	0.536	0.657	0.203
ATT2	0.268	0.437	0.453	**0.863**	0.461	0.510	0.142
ATT3	0.376	0.355	0.460	**0.784**	0.449	0.482	0.169
STK1	0.459	0.413	0.563	0.476	**0.810**	0.468	0.290
STK2	0.444	0.320	0.556	0.408	**0.826**	0.452	0.216
STK3	0.410	0.443	0.587	0.488	**0.821**	0.462	0.159
STK4	0.333	0.444	0.528	0.488	**0.822**	0.552	0.184
IAP1	0.512	0.402	0.462	0.621	0.516	**0.937**	0.333
IAP2	0.500	0.443	0.487	0.577	0.581	**0.939**	0.315
IAP3	0.422	0.474	0.510	0.643	0.545	**0.927**	0.225
IAP4	0.497	0.414	0.540	0.605	0.573	**0.947**	0.309
IME1	0.212	-0.049	0.077	0.131	0.159	0.173	**0.607**
IME3	0.269	0.076	0.149	0.230	0.235	0.286	**0.872**
IME4	0.212	0.084	0.069	0.081	0.182	0.245	**0.757**

Notes: Innovativeness (IN), social Identification (SID), satisfaction (SF), attitude (ATT), stickiness (STK), in-app purchase intention (IAP), in-app monetary effort (IME).